

Army Corrosion Prevention and Control (CPC) Program for *Facilities and Infrastructure*



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ARMY UNIVERSE

(Data collected 30 Sep 09)

Land Acreage

• United States	13,506,291
• Europe	139,981
• Asia	21,405
• Other Overseas	15,309

Roads (paved and unpaved)

59,286 Miles

Paved Area (excluding roads)

423 Million square yards

Railroads

2,522 Miles

Family Housing Units

• Owned	18,721
• Leased	8,544
• Privatized	86,092
• Conveyed	79,477

Barracks

Adequate Spaces

• Permanent Party	150K
• Training	5K
• ORTC	112K

Plant Replacement Value

\$296B

Army Installations

• IMCOM	74
• Army Reserves	4
• National Guard	47
• AMC	30
• SMDC	1
• MEDCOM	2
• DLA	5
TOTAL	163

Army End-Strength

Active	549,015
USAR	205,297
ARNG	358,391
Civilians	245,248
Retired	838,927

Airfield

- 145 Fixed Wing
- 738 Heliports

Buildings

(Million square feet)

• United States	796
• Europe	117
• Asia	34
• Other	7

Army Demographics

58% married
8.9% dual military
6.7% single parents
854,112 family members

Environmental Clean-up Remaining

(*Installation Restoration Program & Military Munitions Response Program*)

• Active Sites	1,327
• BRAC Sites	318
• Formerly Used Defense Sites	1,953

Utilities

Electric, gas,
water and sewer

- 68,613 Miles

FY09 Installation Management Resources = \$28B

(Including \$3B -American Recovery and Reinvestment Act Funding (ARRA))

War on Corrosion

- The 2007 DoD Cost of Corrosion Study determined that the total cost of corrosion for both equipment and infrastructure was \$20 billion/year
- Corrosion of facilities and infrastructure costs the DoD approximately \$1.8 billion/year (FY05 dollars).
 - ▶ 15.1% of the total maintenance budget
- The cost of corrosion in Army facilities and infrastructure was approximately \$0.45 billion/year (FY05 dollars).
 - ▶ 15.8% of the total maintenance budget
 - ▶ Based on Army FY09 SRM, that equates to over \$.5 billion/year

Army Corrosion Prevention and Control Program (CPC)

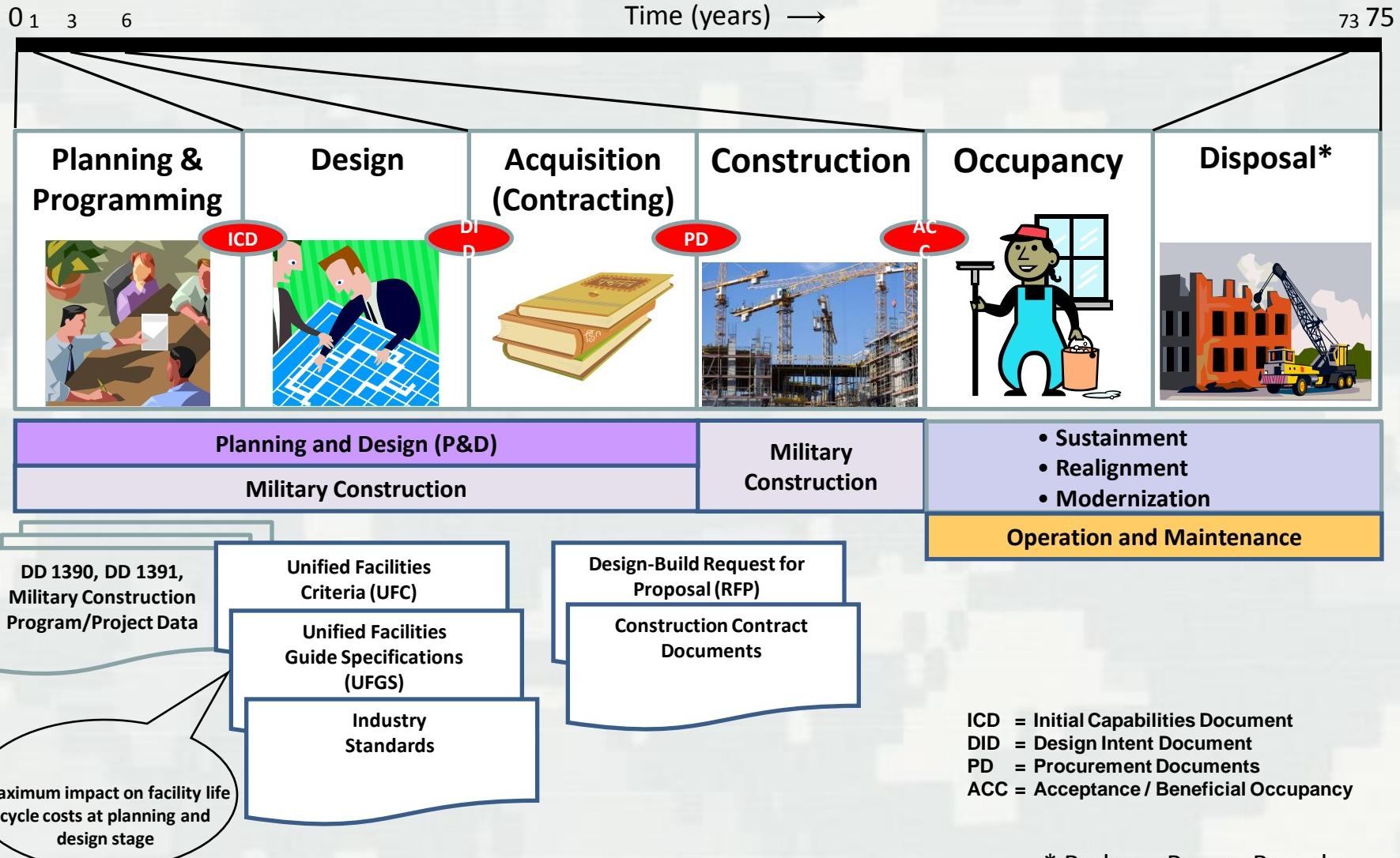
Facilities & Infrastructure

- Reduce life-cycle cost of facilities and infrastructure
 - ▶ Develop strategy for implementing CPC within the Army acquisition life cycle
 - Develop and implement policy and guidance on corrosion prevention and control for Army facilities.
 - Provide guidance for improving maintenance and training in corrosion.
 - Prioritize science and technology requirements to advance the state of the art.
 - Ensure that CPC is fully considered throughout the asset life cycle.

INFRASTRUCTURE ACQUISITION LIFE CYCLE

RDTE 6.1 (Basic Research)

RDTE 6.2 (Applied Research)



Systemic problems will not be solved by individual technical solutions

Army Facilities CPC Program

- Technology Demonstration

- ▶ Validate benefits
- ▶ Develop engineering guidance



- Supports

- ▶ Readiness
- ▶ Sustainability
- ▶ Safety



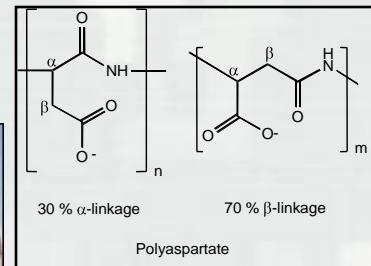
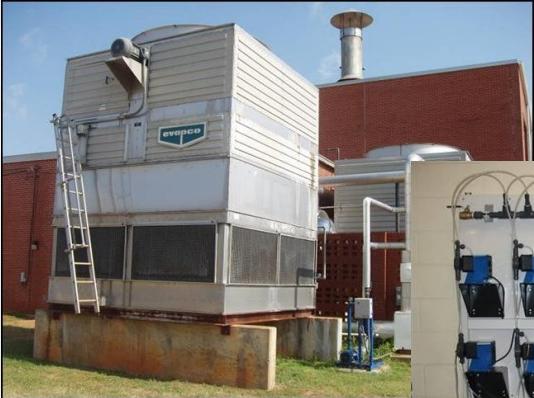
Army Investments

Funds expended on corrosion prevention and control through the OSD Program:

Army Facilities CPC Program Funding Summary

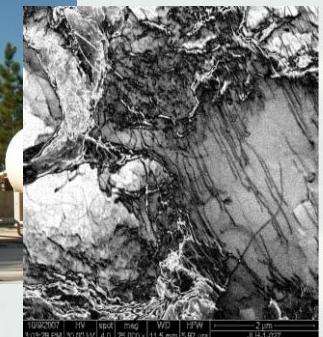
	OSD (\$000)	Service Match (\$000)	Installation Supplemental (\$000)	Total Funding (\$000)
FY09	5,357	5,000	1,120	11,477
FY08	3,853	5,000		8,853
FY07	4,050	5,000		9,050
FY06	4,430	5,000	336	9,766
FY05	4,540	3,905	700	9,145
Total	22,230	23,905	2,156	48,291

AR-F-314 Green Chemical Treatment and Smart Control System for Heating and Cooling Systems



- **Where:** Ft. Rucker, Ft. Hood, Red River Army Depot, Redstone Arsenal, and Brooke AMC
 - **When:** FY 2005 - 2006
 - **Benefits:** Reduced corrosion and fouling of boilers and cooling towers, greater energy efficiency and reduced environmental impact.
 - **Cost:** \$2,600K
 - **ROI:** 13
 - **Payback:** 2.6 years

F07AR19 – Epoxy Coating System Formulated with Carbon Nanotubes



- **Where:** Ft. Bragg, NC
 - **When:** FY 2007 - 2008
 - **Benefits:** Improved coating performance (flexibility, impact resistance, adhesion). Reduced use of heavy metal pigments.
 - **Cost:** \$950K
 - **ROI:** 8
 - **Payback:** 3.7 years

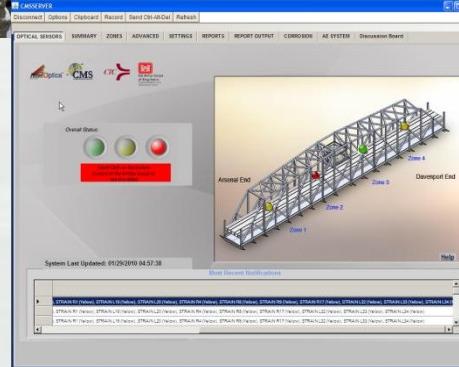
F08AR13: Remote Structural Health and Degradation Monitoring of Bridges

Steel Bridges

Rock Island Arsenal



I-20 Vicksburg, Mississippi



Thermoplastic Composite Bridges



Fort Bragg, NC

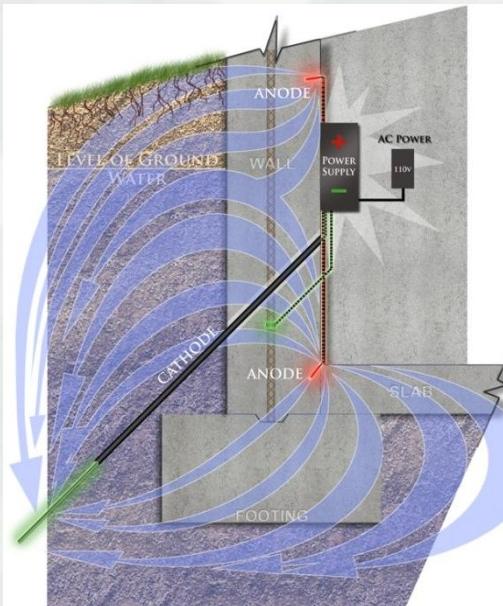
- **Where:** Rock Island Arsenal, I-20 Vicksburg, Mississippi, and Fort Bragg, NC
- **When:** FY2008 - 2010
- **Benefits:** Real time assessment of the condition of critical steel bridge infrastructure and warning of degradation processes that could cause failure. Assessment of long-term performance of innovative thermoplastic composite timber bridges.
- **Cost:** \$2,183K
- **ROI:** 26
- **Payback:** 1.2 years

F08AR07: Polymer Composite Wrapping and Galvanic Cathodic Protection System for Pilings



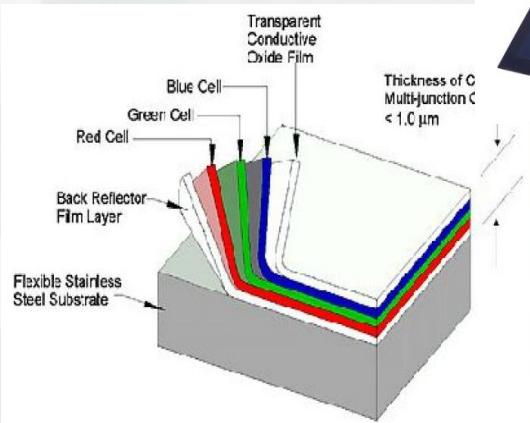
- **Where:** Kawaihae Harbor, HI
- **When:** FY2008 - 2010
- **Benefits:** Polymer composite pile wrap that incorporates galvanic cathodic protection system provides corrosion resistance to steel reinforcements as well as impact and abrasion resistance.
- **Cost:** \$1,092K
- **ROI:** 16
- **Payback:** 1.9 years

F08AR23: EOP & Dehumidification Technologies in Ammunition Bunkers



- **Where:** Kawakami Ammunition Depot, Japan and Naval Ordnance Station, Guam
- **When:** FY2009 - 2010
- **Benefits:** Stop water intrusion into earth covered magazines; maintain interior relative humidity to prevent corrosion and biological growth.
- **Cost:** \$1,205K
- **ROI:** 59
- **Payback:** 0.5 years

F09AR04: Corrosion Resistant Roofs with Integrated Sustainable PV Power Systems



- **Where:** Kilauea Military Camp, HI
- **When:** FY2009 - 2011
- **Benefits:** Metal roofs with high performance coatings and thin film laminate PV appliqués can provide corrosion resistant sustainable roofs and cheap electric power.
- **Cost:** \$688K
- **ROI:** 20
- **Payback:** 1.7 years

F09AR16: Lightweight Fiber Reinforced (Thermoset) Polymer Composite Bridge Decks as Replacement for Steel Reinforced Concrete Decks



- **Where:** Redstone Arsenal, AL
- **When:** FY2009 - 2011
- **Benefits:** Reduced corrosion due to elimination of metallic rebar, reduced weight equates to reduced dead load and increased dynamic live load, low maintenance.
- **Cost:** \$850K
- **ROI:** 10
- **Payback:** 3.0 years

Technology Transfer is Key

- Technology-specific updates to UFCs, TMs, ETLs, and other relevant criteria documents
- Incorporation into Installation Design Standards
- Inclusion in industry standards such as ACMA, ASTM, AASHTO, NACE, AWWA, ICRI
- International data exchange agreements concerning corrosion prevention, control and mitigation:
 - ▶ Australian DoD (executed)
 - ▶ UK Ministry of Defense and Germany (in development)
- Cooperative Research & Development Agreements (CRADAs) with Industry

Challenges

- R&D
- Technology Transfer
- Funding
- Training/Awareness